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The Environmental Effect of the Spring Water in Matwi Catchment/ Palestine

M. Ghanem* and *W. Ahmad

Birzeit University, P.O.Box 14, Ramallah, Palestine

* *Corresponding Author. M. Ghanem. E-mail: mghanem@birzeit.edu*
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Abstract

The main objective of this Research is to determine the pollution level of these springs in reference to physical, chemical and biological parameters. The degrees of pollution of the spring water resulting from flowing of the wastewater inside the Matwi catchment / Salfeet area. The water quality of these springs was studied through determination of the major and minor ion concentrations as well as the microbiological parameters. Their suitability for irrigation purposes and the anthropogenic pollution of these springs was evaluated and indicated that the spring water nearby the wastewater flow wadi is unsuitable for drinking and agricultural purposes. All analysed springs show FC and TC of thousands of colonies / 100 ml, which indicate of wastewater flow contaminations. The hydrochemical properties of all spring samples in the sampling campaigns that was carried out in June 2013 show a water type of Ca – Mg – HCO3, which agrees with the nature of the outcropping of these springs in Sarida Catchment of carbonate rocks. In some of them like the NO3, is due to the pollution of wastewater, especially the Matwi spring in the western side of the catchment of 66 mg/L which is above the WHO standards. The spring water samples are plotted using Piper diagram and all samples are falling in the earth alkaline water with prevailing bicarbonate and in the domain of Ca – Mg – HCO3, which frequently recharging water in limestone and dolomite aquifers of Durov diagram.

Keywords: *Matwi, wastewater, spring water - pollution*

1. Introduction

Due to the importance of water for life and development of communities, there must be a special attention to protect water resources particularly in arid and semiarid areas. Wastewater is considered as one of the most effective contaminator to the water resources; it may affect surface water, springs and groundwater aquifers. Its effect on surface water occurred immediately after receiving the water stream, and indirectly in the case of springs and groundwater aquifers. However, there is carelessness in wastewater management in Wadis in the West Bank which has a high quality strength [1]. This strength is due to low water consumption and people's habits [2]. The main objective of the study is to assess and evaluate the environmental impact of the wastewater discharged from the Israeli colonies inside the Matwi Catchment on the nearby Palestinian communities .This

research is to identify the levels and degrees of pollution of the waters of the springs in the Matwi Catchment. The Matwi drainage basin was chosen for this study as there is a lack of data concerning the impact of the wastewater disposal in the area on the water quality of the located springs. The evidence of pollution and elevated indicator levels for certain parameters from those springs in the drainage area is a potential health hazard for the local inhabitants and the spring water users. It will focus on the determination of the pollution levels of these springs in reference to physical, chemical and biological parameters. To identify the causes of pollution through the laboratory analysis, the micro-biological and the hydrochemical parameters have to be detected. Their suitability for irrigation purposes and the anthropogenic pollution of these springs will be evaluated. The exploration of the pollution sources on its effects on the quality of surface water flow, springs water that are locating along the catchment. An environmental survey reveals that there are 363 disposal sites discharging raw wastewater into the environment in the West Bank [3]. Eight of these are at Al-Qilt catchment which starts from Al-Bireh wastewater treatment plant (5000 m^3/d). Furthermore, there are Israeli colonies and other Palestinian communities discharging their wastewater into the wadi. Moreover, the problem increases when people evacuate their septic tanks by tanker trucks into Al-Qilt wadi at arbitrary places. All these sources are mixed with the urban runoff and dumping site leachates at the winter season. In addition, a report by CH_2MHill, [4] for the Palestinian Water Authority [4] (CH_2Mhill, 1999) concerns the West Bank aquifers and focuses on Al-Qilt catchment in order to understand the potential of wastewater pollution sources to the groundwater. Human activities are known to be significant sources for metals in the environment through waste effluents and atmospheric emission [5]. Other studies [6] [7] [8] reveal that heavy and trace metals derive from human activities such as industrial activities, automobiles, batteries, tyres and wastewater disposal.

The Study Catchment area is a hilly region and extends from Salfit governorate north, towards the south-west of Ramallah governorate, then towards the green line, and ends in the Mediterranean Sea. The climate is semiarid, dry long summer with an average temperature of 22°C and rainy short winter with an average temperature of 11°C, of 650 mm of rainfall. That has a high water quality, representing 50% of fresh water in the area, used by many wells located along the green line of the study area [9].

2. Materials and methods

A spring water sampling campaign for the year 2012/2013 will be carried out for hydrochemical analyses. There are more than twenty springs in Matwi catchment. Among them are the springs of Al Matwi, Al Shalal, Al Mezrab, Al Juz, Al Maseela, Al Fawar, Al Matwi, Abu Nyak, in addition to Aboud springs.The first sampling campgain will be after the spring recharge. The collected samples should include spring water and wastewater samples. Physical (pH, T, EC, Turbidity), hydrochemical (major ions (Ca, Mg, K, Na, CL, HCO_3, SO_4, NO_3), trace elements (Fe, Cr, Pb, Zn, Ti, Ni, Cu, Cd, Co, B)) and microbiological parameters (Fecal and Total Coliform) should be tested by field measurements and lab analyses for spring water and wastewater samples. Ten spring samples were taken and were analyzed at the labs of Birzeit University.

3. Results and Discussion

Two spring water samples will be taken for the year 2013. One sampling was ended which represent the water samples before the renewable recharge to the springs. Table 1 represents the analyzed major ions of these

springs. The physical parameters of these springs are illustrated in Temperature and pH parameters. The Temperature shows a range between 21.8 – 25 °C with an average of 22.9 °C. The pH has an average of 7.6 and shows a difference of 0.4 between the spring samples. The Electric conductivity show a range between 422 to 717 µS. The hydrochemical properties of all spring samples show a water type of Ca – Mg – HCO3, which agrees with the nature of the outcropping of these springs in Matwi Catchment. The cations show an average of 68.7, 26.5 and17.5 mg/L for the Ca, Mg, Na, respectively. The anions show a large range between them. In some of them like the NO3, is due to the pollution of wastewater in some of the springs, especially the Matwi spring in the western side of the catchment. The spring water samples are plotted using Piper diagram and all samples are falling in the earth alkaline water with prevailing bicarbonate (Fig. 1).

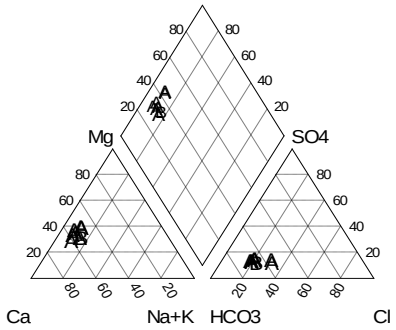

Figure 1. The piper diagram of Matwi spring water samples.

The spring water samples are plotted using Durov diagram and all samples are falling in the domain of Ca-Mg-HCO_3, which frequently recharging water in limestone and dolomite aquifers. The spring water samples are plotting in the Wilcox diagram, which representing SAR against the Conductivity and show all samples falling within the field of S1,C2 (Fig. 2). This means that they are in the zones of medium salinity to low SAR, which is good for agriculture, with the exception of the Matwi Spring. Microbiological analyses of FC and TC show a huge amount of colonies in all springs. It is shown that all samples are infected with microbiological organism's bacteria.

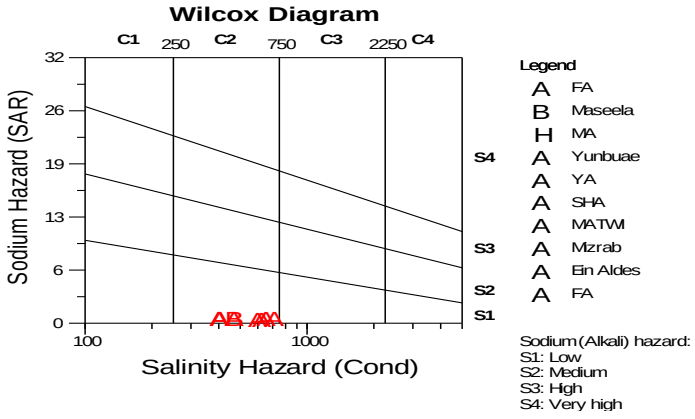

Figure 2. Wilcox Diagram

4. Conclusion

The main objective of this Research is to determine the pollution level of these springs in reference to physical, chemical and biological parameters. The degrees of pollution of the spring water resulting from flowing of the wastewater inside the Matwi catchment / Salfeet area. The water quality of these springs was studied through determination of the major and minor ion concentrations as well as the microbiological parameters. Their suitability for irrigation purposes and the anthropogenic pollution of these springs was evaluated and indicated that the spring water nearby the wastewater flow wadi is unsuitable for drinking and agricultural purposes. All analysed springs show FC and TC of thousands of colonies / 100 ml, which indicate of wastewater flow contaminations. One sampling campaigns was ended which represent the water samples before the renewable recharge to the springs.

The Temperature shows a range between 21.8 – 25 °C with an average of 22.9 °C. The hydrochemical properties of all spring samples show a water type of Ca – Mg – HCO3, which agrees with the nature of the outcropping of these springs in Matwi Catchment of carbonate rocks. In some of them like the NO3, is due to the pollution of wastewater, especially the Matwi spring in the western side of the catchment of 66 mg/L which is above the WHO standards. The spring water samples are plotted using Piper diagram and all samples are falling in the earth alkaline water with prevailing bicarbonate and in the domain of Ca – Mg – HCO3, which frequently recharging water in limestone and dolomite aquifers of Durov diagram.The spring water samples are plotting in the Wilcox diagram, and show all samples falling within the field of S1,C2, which means that they are in the zones of medium salinity to low SAR, which is good for agriculture, with the exception of the Matwi Spring.

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